

### **Remarks**

Claims 1-3, 7, 16-19 and 23-24 are in this case. Claims 4-6, 8-15 and 20-22 have been cancelled. Independent claims 1, 16 and 19 have been amended to more clearly define the invention. Specifically claim 1 has been amended to include limitations from claims 4, 5 and 6. Claim 16, which included the limitations of claim 6 as originally filed, has been amended to include the limitations of claim 4. Claim 19 has been amended to include the limitations of claims 20 and 21. New claims 23 and 24 emphasize the reduced frequency of the narrow band Mach Zehnder as claimed in claim 1 and claim 16. Examples in support of these new claims can be found in paragraph [26] and in Fig. 3.

Claims 1, 16 and 19 are rejected under 35 USC 102(e) as being anticipated by Ito, US Patent No. 6,650,846.

Claims 2-15, 17, 18 and 20-22 are rejected under 35 USC 103(a) as being unpatentable over Ito in view of Farries et al., US Patent No. 6,607,313.

### **35 USC 102(e)**

The claims as amended in the present application define an efficient implementation for realizing polarization bit interleaving of a modulated data stream. As defined in claim 1, the optical modulator includes a “single data modulator” and a means for rotating a polarization state of at least alternate light pulses including a “passive polarization rotator.” The passive rotator is optically coupled to one of “a first and second output port” of a “narrow band Mach Zehnder.” Separating pulses using the narrow band Mach Zehnder and a passive rotator enables the claimed modulator to operate at a lower voltage than a prior art device using an active rotator, without the complexity of multiple data modulators.

Claim 16 as amended specifically defines an integrated device including a single “second Mach Zehnder data modulator,” a third Mach Zehnder having a first output port and a

second output port for separating alternate pulses, and a passive polarization rotator optically coupled to the first optical path. This again defines the single data modulator and passive rotator in a polarization bit interleaving system and the structure that enables this combination.

Claim 19, as amended defines a method which also includes the steps of encoding a single pulse train, and passing alternate pulses through a passive polarization rotator. This method cannot be practiced as taught by Ito.

Ito discloses no specific example for implementation for polarization bit interleaving. At column 9 lines 46-53, Ito suggests that for an RZ system can be made using a single intensity modulator. But no suggestion of how this would be integrated with a polarization rotator is provided. No first optical path or second optical path separating alternate pulses is suggested. It is implied that an active polarization rotator would be used. But this would not achieve the advantages of the claimed invention. The claimed structure of the present invention to achieve these advantages of design simplicity and power savings, are not disclosed by Ito.

### **35 USC 103(a)**

Claims 2-15, 17, 18 and 20-22 are rejected under 35 USC 103(a) as obvious in view of Ito and Farries. Farries does disclose a passive polarization rotator for use with a bit interleaving system having two data modulators. However, there is no suggestion in either reference of how to integrate this passive polarization rotator into a single data modulator system suggested by Ito. Claims elements from claims 4-6 defining the structure for directing alternate pulses from a single encoded data train into a passive polarization rotator, now included in amended claim 1, must be considered within the structure of the independent claim. First and second optical paths from first and second data modulators of Farries cannot be placed in a single data modulator system without further direction.

It is argued in the Office Action with respect to claim 5, that the polarization control circuit shown schematically in Ito discloses “a means for directing alternate light pulses to a first optical path and a second optical path” which comprises “a driver electrically coupled to the pulse generator.” This is an impossible combination without the teaching of the present application. Ito has no first and second optical path, so clearly the polarization control circuit is not anticipated to perform this function. The first and second optical paths from the two data modulators in Farries are synchronized passively by a delay line in the form of a birefringent crystal.

It is stated in the Office Action that claim 6 defining a narrow band Mach Zehnder “for directing alternate light pulses to a first optical path and a second optical path,” is disclosed by Farries two data modulators which are Mach Zehnders. This claimed structure is not the structure disclosed by Farries.

Furthermore, claims 17 and 18 define a reflective structure for combining multiple integrated waveguide devices on a single substrate in an efficient manner which is nowhere suggested in the prior art of record. It is suggested in the Office Action that this structure is disclosed by Farries. The GRIN lenses 50a and 50b of Farries are simply focusing lenses for directing light into the polarization rotator and for directing the combined pulse train into an optical fiber. No coupling of light between integrated waveguide devices using a GRIN lens and reflective element is shown.

The limitations of claims 20 and 21 now incorporated into claim 19 with the positive limitation of a “passive” polarization rotator cannot be found in the Ito reference. Alternate pulses in Ito do not pass through a passive polarization rotator, nor are there alternate pulses which do not pass through a passive polarization rotator.

Applicant submits that remaining dependent claims 2, 3, 7, 17, 18 and new claims 23 and 24 are not obvious in view of Ito and Farries as dependent on allowable independent claims.

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Examiner: Dzung D. Tran

In view of the amendments and remarks above, Applicant submits that all the claims are in condition for Allowance. Applicant respectfully requests reconsideration of this application.

Applicants request confirmation of consideration of the IDS filed with the application in the U.S. Patent and Trademark Office on July 5, 2001.

Should any minor informalities need to be addressed, the Examiner is encouraged to contact the undersigned attorney at the telephone number listed below.

**The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account No: 50-1465.**

**Please associate this application with Customer No: 26381**

Respectfully submitted,



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